Decision Making, Artificial Intelligence, and ESG Regulations

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The growing incorporation of Artificial Intelligence (AI) into environmental, social, and governance (ESG) practices, alongside non-financial reporting, is reshaping decision-making processes within organizations. This research investigates the multifaceted impact of AI on ESG decision making, exploring how AI-driven tools and analytics support strategic decisions pertaining to the implementation of the CSRD Directive. The research method is the analysis of the content of documents and their examination in terms of determining the basic areas of decision-making, identifying the risks associated with these decisions, and developing a methodology for using AI in these decision-making processes. The analysis concludes that although AI can provide substantial support in executing the CSRD directive, it is incapable of substituting a knowledgeable team familiar with the company's specific environment. The research did not include any empirical methods that would allow one to understand the practical possibilities of using AI in decision-making processes related to the implementation of the CSRD directive by companies. The study exposes the significant scope for exploration in the practical applications of AI, serving as a potential foundation for advancing decision-making processes within contemporary corporate management.

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1   Introduction

In the aftermath of the COVID-19 pandemic, two domains have emerged as particularly critical within the scientific research and analysis: artificial intelligence (AI) and ESG (Environment, Social, Governance). The first, although known for years, at the time of widespread and easy access for everyone reveals both benefits and threats. The latter topic is progressively anticipated by society; however, it poses significant financial challenges for entrepreneurs. The application of AI to many areas related to ESG appears to be particularly significant (Rane, Choudhary, Rane, 2024; Zhang, Yang, 2024). However, it is imperative to remain aware of the potential risks associated with the deployment of AI across diverse socio-economic sectors (Sætra, 2023b).

The increasing integration of Artificial Intelligence (AI) into environmental, social, and governance (ESG) practices, as well as nonfinancial reporting, is transforming decision-making processes within organizations (Burnaev et al. 2023). A comprehensive examination of the EU directives and related documents concerning non-financial reporting clarifies the potential advantages and challenges inherent in the adoption of AI. These include enhancements in data analysis, augmented predictive capabilities, and ethical considerations related to algorithmic bias and transparency.

The CSRD directive indicates three areas of strategic decision making: risk analysis, stakeholder participation in the process of developing the ESG strategy and nonfinancial report preparations, and the selection of indicators which indicate the impact of the organization on the natural and social environment. The question arises as to what extent artificial intelligence helps in these decisions and to what extent it poses an ethical challenge to decision makers.

The research explores the multifaceted impact of AI on ESG decision-making, examining how AI-driven tools and analytics may help strategic choices related to decisions connected with the CSRD Directive implementation. Furthermore, the study investigates the evolving landscape of ESG regulation and its interaction with AI-driven decision making, aiming to identify best practices and potential areas for regulatory adaptation.

The preliminary analysis of scientific articles shows that the number of studies, analyses, theoretical considerations, and practical implications related to the impact of AI on ESG is systematically growing. Thus, two selection criteria introduced in Google Scholar - AI and ESG - reveal that 16,900 articles have been published since 2021, and, when considering the comprehensive range of collections available on this platform, the figure amounts to 105,000. Of course, the number of articles is not a sufficient evaluation criterion. It is anticipated that a comprehensive analysis of the content of these sources will be necessitated in due course. However, it undoubtedly serves as testimony to the significance and interest in the subject matter within the current scholarly discourse and the practical application of the ESG strategy and reporting.

Among the numerous analyses, there are studies on the impact of AI on ESG performance (Li, et al., 2025), on explainable artificial intelligence (XAI) techniques to analyze sentiment towards environmental, social and governance (ESG) factors, climate change and green finance (van Heever et al., 2024) and the impact of AI on ESG implementation (Sætra, 2021). Artificial intelligence, as a tool, is increasingly utilized across diverse applications encompassing the systematic preparation, execution, reporting, and assessment of ESG activities (Lee, et al., 2024). In addition, there are built-in models, research frameworks, and tools enabling access to AI integration with ESG that is important to investors (Lee et al., 2024). Researchers also draw attention to the need for legal regulations that will allow the avoidance of risks, including cyberattacks or disinformation, and that will allow the protection of people. On the one hand, AI is a tool supporting ESG, but on the other hand, its potential is not yet fully understood and may be the cause of disruption (Maghami, 2024). Novel technologies, such as C3 AIESG, are emerging, fundamentally altering the management of ESG strategies and performance. These advancements in AI capabilities facilitate the identification of new value creation opportunities swiftly and adaptively in response to evolving conditions. ESG big data platforms are also being created, which leverage rich data resources and computing power to improve the ESG decision-making process (Zu et al., 2024).

The operation of artificial intelligence, specifically through its associated devices, involves substantial energy consumption. Hence, research is also being conducted to find new optimal architectures of AI with lower computational costs towards Sustainable AI or Green AI (Budennyy, 2022) or Responsible AI (Minkkinen,

Niukkanen, Mäntymäki, 2024) or Responsible Use of AI (Lim, 2024). Research is also being conducted on the use of ESG guidelines and AI support for effective analysis of the energy system and realization of sustainable development objectives through the utilization of the energy industry's efficiency and reliability (Li et al., 2024).

On April 21, 2021, the European Commission published the Corporate Sustainability Reporting Directive (CSRD), which aims to introduce transparency requirements for corporate sustainability, with uniform reporting standards that ensure comparability of information. One of the requirements is reporting via digital tagging in a machine-readable format, which opens up opportunities for much wider use of AI.

The framework of the article is structured as follows: The subsequent section explains the methodological assumptions underpinning the research, followed by a discourse on the employed research method. The following chapter provides an analysis of the results and is concluded with a summary that offers a perspective on potential avenues for future research.

2   Methodology

The incorporation of AI within business management strategies signifies a substantial transformation in the methodologies through which corporations address decision-making processes and enhance operational efficiency. This section explores the domains in which AI can be utilized in decisions associated with the imperative to implement the CSRD directive.

The initiation of the analysis is grounded in the European Union documents that introduce the obligation for nonfinancial reporting. This requirement extends beyond the selection of indicators, the collection and publication of data, encompassing the comprehensive strategic management process, which forces the management of a company to make numerous strategic, tactical, and operational decisions. Considering this requirement, at least three research questions emerge:

1. Which management decisions related to the implementation of the CSRD directive can be facilitated by AI?

2. What AI tools will be valuable in the decision-making process?
3. What are the ethical implications of using AI in ESG decision-making?

The research methodology employed was a comprehensive review of the literature of scientific publications, with the aim of revealing the stages involved in the implementation of the directive where AI tools could be applied. The literature exploration was executed using the databases Google Scholar and Academic Search Ultimate. The selected keywords encompassed terms such as 'decision', 'decision-making', 'artificial intelligence', 'AI', 'ESG', and 'CSRD'. These terms facilitated the identification of elements within the implementation of the directive that are closely related to management decisions. In addition, the literature search concentrated on extracting suggestions or conclusions derived from the research, which confirmed that AI can be safely employed to strengthen the decision-making process. The research methodology involves conducting a content analysis of documents associated with the CSRD, aiming to delineate fundamental decision-making domains, identify the attendant risks of these decisions, and formulate a methodology for integrating AI in these decision-making processes.

3 Results and analysis

A review of the documents, including the CSRD directive and ESRS standards, facilitates the identification of the following areas relevant to decision-making:

1. Dual materiality analysis
2. Stakeholder involvement
3. Strategy and Governance
4. Indicators and data
5. Disclosures and transparency
6. External assurance.

Table 1 illustrates that AI technologies may be employed in the decision-making process for certain cases, though not universally (Senadjki, et al.,2023; Rane, et al., 2024; Rane, Choudhary, Rane, 2024). It elucidates the critical decision-making factors as delineated in the CSRD directive and ESRS standards and observes that AI technologies may facilitate certain decision-making processes, albeit uncommonly.

Table 1: AI Integration in Decision-Making for CSRD Directive Implementation

No.	Application Area	Description	AI Technologies involved
1	Dual materiality analysis	a. Identification of material issues: defining the sustainability concerns that are significant from both a financial standpoint (influence on organizational value) and from the perspective of the company's environmental and societal impacts. b. Materiality Assessment: evaluate which of the identified concerns are of sufficient significance to warrant a comprehensive discussion in the report.	Large language models (LLMs) can map the environmental and social impacts of the company (1). Natural Language Processing (NLP) can analyze documents to identify concerns (2). AI prompts and their application (3).
2	Stakeholder participation	a. Identify stakeholder groups: identify all groups that affect or are affected by the firm. b. Prioritize stakeholders: identify which stakeholder groups are key to sustainability and which have the greatest impact on the firm. c. Integrate the results into the ESRS report: results of inclusion participation in the ESRS report, describing the engagement process, and presenting the views of the stakeholders.	AI can help create stakeholder maps that visualize the relationships between a company and its stakeholders. This allows for the identification of key relationships and potential conflicts. NLP enables the analysis of large volumes of textual data from various sources, such as social media, news articles, and reports (4).
3	Strategy and Governance	a. Articulate the Sustainability Strategy: specifying the organization's sustainability objectives, strategic frameworks and corresponding action plans. b. Governance Framework: providing a detailed account of the organizational governance framework as it pertains to sustainability, including an exposition of the roles and responsibilities assumed by governance bodies. c. Due diligence mechanisms: explaining the due diligence mechanisms employed to identify and mitigate potential sustainability risks.	NLP can interpret the text into policies, objectives, and strategic framework (5).
4	Indicators and Data	a. Selecting indicators: Selecting appropriate indicators that will allow for measuring and monitoring progress toward achieving the CSRD requirements.	Machine learning (ML) algorithms can automate the collection of data from various systems

No.	Application Area	Description	AI Technologies involved
		b. Data collection and verification: ensuring the credibility and quality of the data presented in the report, including through the implementation of appropriate collection and verification processes.	and databases, ensuring consistency (6).
5	Disclosures and Transparency	a. Scope of disclosure: Decisions on what information will be disclosed in the report, in accordance with ESRS requirements. b. Form of presentation: choosing an appropriate form of presentation of information so that it is understandable and useful to stakeholders.	LLMs can generate the first draught of the report based on the data gathered, reducing the need for multiple interactions (7).
6.	External assurance	a. Auditor Selection: choosing an independent auditor to perform the audit of the report. b. Scope of the audit: defining the scope of the audit.	Machine learning models cam validate data ensuring that numerical data aligns with narrative statements and flagging any inconsistencies (7).

Source: Own elaboration

AI tools can be useful, but it should be noted that they struggle with common sense reasoning, intuitive understanding, and lack of contextual awareness (8). It excels at pattern recognition and replication but lacks the ability to innovate or produce truly novel ideas that go beyond its training data. The use of AI in the decision-making process for Corporate Sustainability Reporting Directive (CSRD) implementation brings several significant ethical concerns (9). These arise from the nature of AI's operations, the data it relies on, and the potential impact on various stakeholders. For example, AI algorithms are trained using datasets, but these datasets might encompass pre-existing societal or organizational biases (e.g., historical underreporting of certain environmental impacts), there is a risk that the AI system might exacerbate these biases in its analytical processes and recommendations for the implementation of the CSRD (Manyika, Silberg, Presten, 2019). Numerous sophisticated AI models, especially those employing deep learning techniques, function as so-called "black boxes". This characteristic poses challenges in comprehending the methodologies through which they originate conclusions or recommendations. (Gastounioti, Kontos, (2020). A further ethical concern associated with the implementation of the CSRD relates to the processing of sensitive data encompassing environmental performance, employee demographics,

and supply chain practices. Employing AI for the analysis of this data engenders concerns regarding data privacy, potential security breaches, and the risk of unauthorized access. The involvement of AI in decision-making for the implementation of the CSRD complicates the attribution of accountability in the event of errors or unforeseen adverse outcomes. It raises the rhetorical question of whether the ethical responsibility lies with the AI's developer, the organization that deploys it, or the AI entity itself (Coeckelbergh, 2020).

In conclusion, artificial intelligence can significantly expedite the implementation process of the CSRD directive; however, it will not supersede a well-informed team that possesses comprehensive knowledge of the company, its environment, along with relevant legal and ethical regulations.

4   Conclusions and Discussion

The article examines the capabilities and limitations of artificial intelligence (AI) tools in the implementation of the CSRD directive, highlighting their proficiency in pattern recognition and application support, while acknowledging their difficulties with common sense reasoning, intuitive understanding, and contextual awareness. Regarding the first inquiry, it is important to note that nearly every managerial decision related to the implementation of the Corporate Sustainability Reporting Directive (CSRD) can be aided by AI tools. Concerning the second question, it must be acknowledged that the tools mentioned are merely illustrative. AI is currently evolving at a significant pace, making it challenging to identify a singular or even optimal tool. Ethical considerations regarding fairness and accountability should also be underscored. The analysis concludes that although AI can provide substantial support in executing the CSRD directive, it is incapable of substituting for a knowledgeable team familiar with the specific environment of the company. It also comments on the swift advancement of AI, making it difficult to determine the best definitive tool.

The research did not include any empirical methods that would allow one to understand the practical possibilities of using AI in decision-making processes related to the implementation of the CSRD directive by companies. Therefore, the conclusions are only an indication of a further area of research necessary both for the development of theory addressing the issue of practical use of AI, but also for

the practice of companies that must, for both legal and social reasons, transparently disclose their impact on the environment and society.

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